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| 09/681,431 | 04/04/2001 | Radislav Alexandrovich Potyrailo | RD-27767 | 4767 |

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| EXAMINER | |
|---|---|
| SINES, BRIAN J | |
| **ART UNIT** | **PAPER NUMBER** |
| 1743 | 3 |

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

| Office Action Summary | Application No. 09/681,431 | Applicant(s) POTYRAILO, RADISLAV ALEXANDROVICH |
|---|---|---|
| | Examiner Brian J. Sines | Art Unit 1743 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-49 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-49 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1 – 3, 5 – 7, 10 – 17, 20 – 24, 27 – 30, 32 – 35 and 37 – 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. (U.S. Pat. No. 5,117,146 A) in view of Mansky (U.S. Pat. No. 6,553,318 B2). Regarding claims 1, 24, 27, 28, 35, 40 and 43, Martin et al. teach a screening system for evaluating chemical or corrosion resistance using an acoustic wave sensor. As shown in figures 1 and 2, Martin et al. teach that a material in the form of a thin film (5) is deposited on the top surface of the substrate (12) of the surface acoustic wave sensor. A chemical (liquid, LQ), which is placed in cell (20), is in direct contact with the surface of the thin film of material (5). Martin et al. teach that the surface acoustic wave sensor detects changes in the characteristics of the thin film due to the adsorption, absorption, deposition,

removal, or desorption of material, or changes in the mechanical properties of the thin film due to the exposure of the thin film to the liquid (see col. 2, lines 40 – 68; col. 3, lines 17 – 68; col. 4, lines 1 – 63; col. 5, lines 28 – 66 & col. 6, lines 3 – 56). Martin et al. do further teach measuring methods and means (see col. 4, lines 20 – 51). However, Martin et al. is silent to the specific teaching of providing a screening system comprising a plurality of acoustic wave sensor devices for screening a plurality materials for chemical or corrosion resistance. Mansky does teach an array-based system for rapid materials characterization using a plurality of acoustic wave sensors (see col. 37, lines 3 – 67). Mansky does teach that advances in combinatorial materials science produce libraries containing a vast number of member chemical compounds, which need to be screened for desired performance characteristics and material properties (see col. 1, lines 6 – 67 & col. 2, lines 1 – 44). Therefore, it would have been obvious to one of ordinary skill in the art to provide an array-based screening system for evaluating a plurality of materials for chemical or corrosion resistance using an acoustic wave-based sensing system, as taught by Martin et al. in view of Mansky, in order to provide a screening system which can test a multitude of materials for chemical or corrosion resistance rapidly and efficiently. Furthermore, as discussed above, Martin et al. teach a single screening system component, inter alia, comprising: at least one chemical selected from a plurality of chemicals; a plurality of materials exposable to the chemical; and a plurality of acoustic wave sensor devices. The applicant's disclosure does not explain why or how providing an array-based system incorporating such a screening system component would produce any supposed new and unexpected results.

Therefore, it would have been further obvious to one of ordinary skill in the art to provide a screening system for evaluating a plurality of materials for chemical or corrosion resistance using an acoustic wave-based sensing system, as taught by Martin et al., in an array-based configuration, since the Courts have held that the mere duplication of parts, without any new and unexpected results, is within the ambit of one of ordinary skill in the art (see In re Harza, 124 USPQ 378 (CCPA 1960)). Regarding claim 2, Martin et al. teach that the measured acoustic wave properties result from changes in sensor surface conditions comprising changes in the characteristics of the thin film material, which correlate to a mass of dissolved or removed thin film material (col. 4, lines 20 – 29). Regarding claim 3, the mass of dissolved material is in the range of about $1 \times 10^{-15}$ g to about $1 \times 10^{-3}$ g. For example, as shown in figures 1 and 2, the single quartz crystal substrate used in the preferred embodiment has a rectangular configuration having the following dimensions: length (l) = 11.4 mm (1.14 cm) & width (w) = 7.6 mm (0.76 mm) (see col. 4, lines 52 – 56). Hence, the top surface area of the quartz crystal is: $l \times w = 1.14 \text{ cm} \times 0.76 \text{ cm} = 0.8664 \text{ cm}^2$. Martin et al. further teach that to demonstrate the monitoring of an etching process, the dissolution of a 4,200 Å ($4.2 \times 10^{-5}$ cm) thick aluminum film in a 0.3 % NaOH solution was followed to completion (see col. 6, lines 49 – 56). Assuming that the same quartz crystal is being used as described previously in the preferred embodiment and, for simplicity, that the aluminum film is pure, elemental aluminum and coats the entire top surface area of the quartz crystal, an estimate of the mass of dissolved material can then be made from the teachings of Martin et al. For elemental aluminum, the density ($\rho$) at 25 °C is reported to be 2.70

g/cm$^3$ by the CRC Handbook of Chemistry and Physics (3$^{rd}$ Electronic Edition). The volume (V) of dissolved or removed aluminum is equivalent to the top surface area of the quartz crystal multiplied by the thickness of the aluminum film removed: V = 0.8664 cm$^2$ x 4.2 x 10$^{-5}$ cm = 3.638 x 10$^{-5}$ cm$^3$. The mass of dissolved material (removed aluminum) is $\rho$ x V = 2.70 g/cm$^3$ x 3.638 x 10$^{-5}$ cm$^3$ = 9.82 x 10$^{-5}$ g, which is between 1 x 10$^{-15}$ g and 1 x 10$^{-3}$ g. Regarding claim 5, Martin et al. teach that the acoustic wave device is a two-port device (see col. 4, lines 12 – 19). Regarding claim 6, Martin et al. teach that the acoustic wave device is a piezoelectric device (see col. 7, lines 1 – 5). Regarding claim 7, Martin et al. teach the use of an acoustic plate mode (APM) device (see col. 2, line 66 – col. 3, line 6). Regarding claim 10, Martin et al. teach that the acoustic wave property is acoustic wave velocity and attenuation (see col. 3, lines 17 – 36). Regarding claims 11 and 20, Martin et al. teach the use of a frequency counter (see col. 4, lines 45 – 51). Regarding claim 12, Martin et al. teach that the mass of material under study, such as for the aluminum film as discussed above, is approximately 9.82 x 10$^{-5}$ g, which is between 1 x 10$^{-12}$ g and 1 g. Regarding claims 13 and 21 – 23, Martin et al. teach that the acoustic wave property change is followed with respect to the time exposure of the chemical to the thin film material (see col. 6, lines 49 – 56). Furthermore, regarding claims 21 – 23, the measured acoustic wave property would differ from the initial and the subsequent measurements as material is dissolved from the surface of the substrate. Furthermore, regarding claims 23, 33, 34 and 37, the acoustic property measurements of the substrate would be a function of a mass of absorbed material or chemical, since the device is sensitive to the mass

loading and mechanical properties of the material present upon the sensor surface (see Martin et al., col. 5, lines 11 – 66). Regarding claims 14 – 16 and 38, Martin et al. teach that the frequency shift in a time period of approximately 4 minutes was monitored during the demonstration of an etching process (see col. 6, lines 49 – 56). Regarding claim 17, Mansky teaches that the disclosed screening system and method may be employed with polymers. Therefore, it would have been obvious to employ the system, as taught by Martin et al. in view of Mansky, in order to provide an effective screening system for combinatorial libraries comprising polymer materials (see col. 17, lines 5 – 52; col. 37, lines 3 – 51). Regarding claims 29 and 30, Martin et al. teach that the system operates with an acoustic synchronous frequency of 158 MHz (see col. 4, lines 63 – 66). Regarding claim 32, Martin et al. teach that the oscillation source comprises an oscillating potential (see col. 4, lines 29 – 51). Regarding claim 39, Mansky teaches the use of a computer in monitoring and controlling the screening system (see col. 2, lines 45 – 67). It would have been obvious to one of ordinary skill in the art to further utilize a computer to monitor and control the screening system, as taught by Martin et al. in view of Mansky, in order to effectively monitor and control a complex screening system screening a library containing a multitude of thin film materials. Regarding claims 41 and 42, as discussed above, the change in mass of the aluminum film removed is about $9.82 \times 10^{-5}$ g, which is in the range of about 1 picogram to about 1 milligram and in the range of about 1 nanogram to about 1 microgram. Regarding claims 44 – 49, Martin et al. in view of Mansky teach all of the structure provided in the claimed method, which merely recites the conventional operation of that structure. It

would have been obvious to one of ordinary skill in the art to perform the method recited in the instant claim upon the screening system, as taught by Martin et al. in view of Mansky, as such is the intended operation of that system.

Claims 4 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. in view of Mansky as applied to claims 1 – 3, 5 – 7, 10 – 17, 20 – 24, 27 – 30, 32 – 35 and 37 – 49 above, and further in view of Potyrailo et al. (U.S. Pat. No. 6,360,585 B1). Neither Martin et al. or Mansky teach the use of a one-port device. Potyrailo et al. teach the use of a one-port acoustic wave device, such as a thickness shear mode (TSM) device (see col. 6, lines 17 – 27). Potyrailo et al. teach that the resonator employed can be any type of device having vibration characteristics that vary based on a chemical in contact with the surface of the device. Potyrailo et al. teach that some transducers based on resonators are not always accurate or even useful for all chemical compounds (see col. 1, lines 28 – 48; col. 4, lines 26 – 39; col. 5, lines 55 – 65; col. 7, lines 30 – 47). One of ordinary skill in the art would logically select a particular sensing transducer or resonator, which would provide the best sensitivity based on the chemical system being studied. Therefore, it would have been obvious to one of ordinary skill in the art to incorporate a TSM device, as taught by Potyrailo et al., with the system, as taught by Martin et al. in view of Mansky, in order to provide an optimal sensing mechanism for the apparatus depending upon the response characteristics of the system under study. Regarding claim 31, Potyrailo et al. teach that incorporated TSM device operates at a frequency of 10 Mhz (see col. 6, lines 17 – 27).

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. in view of Mansky as applied to claims 1 – 3, 5 – 7, 10 – 17, 20 – 24, 27 – 30, 32 – 35 and 37 – 49 above, and further in view of Wauk, II (U.S. Pat. No. 3,818,379). Neither Martin et al. or Mansky teach the use of a non-piezoelectric acoustic wave device. Wauk, II does teach the use of a non-piezoelectric device, such as a cantilever device incorporating the use of non-piezoelectric ZnO (see col. 2, line 30 – col. 4, line 65). It would have been obvious to one of ordinary skill in the art to employ a non-piezoelectric acoustic wave device in order to provide an optimal sensing mechanism for the apparatus depending upon the response characteristics of the system under study.

Claims 18, 19, 25, 26 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. in view of Mansky as applied to claims 1 – 3, 5 – 7, 10 – 17, 20 – 24, 27 – 30, 32 – 35 and 37 – 49 above, and further in view of Gregorovich et al. (U.S. Pat. No. 6,284,311 B1). Regarding claims 18, 25 and 26, Neither Martin et al. or Mansky teach the use of the screening system, as taught by Martin et al. in view of Mansky , in the screening of polyolefins for corrosion resistance. Gregorovich et al. do teach that polyolefins are useful in coating metal materials in order to provide chemical or corrosion resistance (see col. 1, lines 1 – 20; col. 3, lines 46 – 65). Regarding claims 19 and 36, it is well known in the art that water is a causative agent in the formation of corrosion on metal substrate surfaces. It would have been obvious to one of ordinary skill in the art of employ the screening system, as taught by Martin et al. in view of Mansky, in the screening of polyolefin polymeric materials for corrosion resistance, as

taught by Gregorovich et al., in order to provide polyolefin coating materials which provide effective chemical or corrosion resistant properties.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Matsiev et al. '079 & '895 teach a method and apparatus for characterizing materials by using a mechanical resonator. Wohltjen '228 teaches methods and apparatus using a surface acoustic wave in studying physical parameters of polymers. Ballato '697 teaches a chemical sensor matrix comprising a plurality of resonators embedded in a single monolithic piezoelectric crystal. Granstaff et al.'215 teach a method using a quartz crystal microbalance in measuring solid mass accumulation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Sines, Ph.D. whose telephone number is (703) 305-0401. The examiner can normally be reached on Monday - Friday (11:30 AM - 8 PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (703) 308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

BJS
June 26, 2003

Jill Warden
Supervisory Patent Examiner
Technology Center 1700